# Development of Serious Game for Kids using Leap Motion based on Honey Bee Dance

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**Abstract.** We developed serious game for kids using ‟Leap Motion" based on honey bee dance. After investigation of honey bee dance, we applied it into serious game. The dances are performed by worker bees that have returned to the honeycomb. It essentially is a language that tells the other workers where the food is. In our developed game, kids can learn these honey bee dance using their hands via Leap Motion. Leap Motion is a computer hardware sensor device that supports hand and finger motions as input, analogous to a mouse, but requiring no hand contact or touching. The movement of the hand is good for kid's brain development. It has already been proven through many materials. Kids can learn the language of bees through developed game and it is a natural form of play. Our system can propose the new development direction of serious game, also potential of Leap Motion as serious game device.

**Keywords:** serious game, honey bee dance, Leap Motion

## 1 Introduction

A serious game or applied game is a game designed for a primary purpose other than pure entertainment. The "serious" adjective is generally pretended to refer to products used by industries like defense, education, scientific exploration, health care, emergency management, city planning, engineering, religion, and politics. Educational game for kids is an active field in serious game. Kids cannot control computer well, so many educational game contents are developed into easy and fun play form. In this, interaction device is important. Leap Motion is latest interaction device and low price, also setup and using are very easy especially to kids. We developed serious game for kids using ‟Leap Motion" based on honey bee dance. Bee is Bees are flying insects closely related to wasps and ants, and are known for their role in pollination and for producing honey and beeswax. Bees are familiar with kids through fairy tales or toys and games. After investigation of honey bee dance, we applied it into serious game. The dances are performed by worker bees that have returned to the honeycomb. It essentially is a language that tells the other workers where the food is. In our developed game, kids can learn these honey bee dance using their hands via Leap Motion. Leap Motion is a computer hardware sensor device that supports hand and finger motions as input, analogous to a mouse, but requiring no hand contact or touching. Kids learn through play, so naturally they are immersed. In

addition, the development of technology effects on game quite a lot and in a game interaction and immersion is also important elements. Janet H. Murray explained the 'Immersion' is a pleasant experience that going into exquisitely processed illusion fantasy world.[1] The immersion in game is important element to make the player continuously play the game.[2] On the 2nd chapter arrange the related works about Leap Motion and honey bee dance, in the 3rd chapter we developed educational serious game and for the last 4th chapter arrange the conclusion and future study to finish the paper.

## 2 Related work

Our study uses Leap Motion to play developed game contents. Kids play game using their hands. Kid"s hands control and simulate flying bee in 3D virtual world. In this section we present about Leap Motion and honey bee dance.

### 2.1 Leap Motion



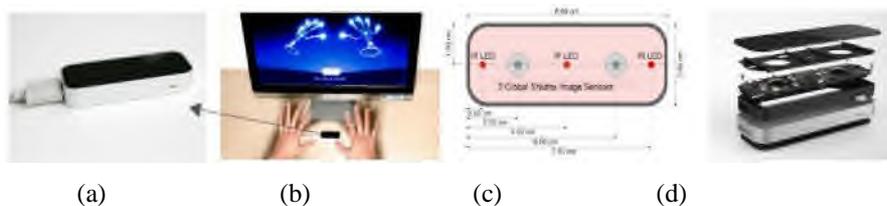| (a) | (b) | (c) | (d) |

**Fig. 1.** Leap Motion(a) , Leap Motion pc connect test image(b), structure of Leap Motion(c)(d)

The Leap Motion(Fig 1) controller is a small USB peripheral device which is designed to be placed on a physical desktop, facing upward. Using two monochromatic IR cameras and three infrared LEDs, the device observes a roughly hemispherical area, to a distance of about 1 meter (3 feet). The LEDs generate a 3D pattern of dots of IR light[3] and the cameras generate almost 300 frames per second of reflected data. The Leap Motion was shown to perform tasks such as navigating a website, using pinch-to-zoom gestures on maps, high-precision drawing, and manipulating complex 3D data visualizations.[4]

### 2.2 Honey bee dance

There are two honey bee dances, round dace and waggle dance. Honey bee dace is the language of bee. Performed by a worker bee that has returned to the honey comb with pollen or nectar. It expresses telling to other workers where the food is. By signaling both distance and direction with particular movements, the worker bee uses the dance language to recruit and direct other workers in gathering pollen and nectar. When bee find a food source, and if it is very close to the hive (less than 50 meters), a forager

performs a round dance as Fig 2, it is round dance. The waggle dance(Fig 3) is performed to express distance and direction of food to other worker bee, when food sources are more than 150 meters from the hive.[5]
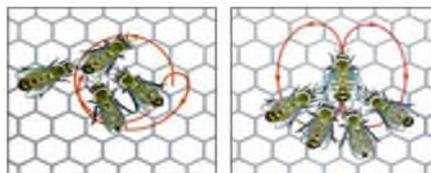


**Fig. 2.** Round Dance(left) and Waggle Dance(right) of Honey Bee

## 3 Development

**Table 1.** Game development specifications

| Category | Spec |
|---|---|
| Play device | Leap motion |
| Play mothod | Hand gesture |
| gesture | Point and circle |
| Dance of bee | Round and waggle |
| Target age | 5~10 |
| program | Unity3D[1] |



**Fig. 3.** Game play flow plan

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[1] Unity is a cross-platform game engine with a built-in IDE developed by Unity Technologies. It is used to develop video games for web plugins, desktop platforms, consoles and mobile devices. It grew from an OS X supported game development tool in 2005 to a multi-platform game engine.[6]
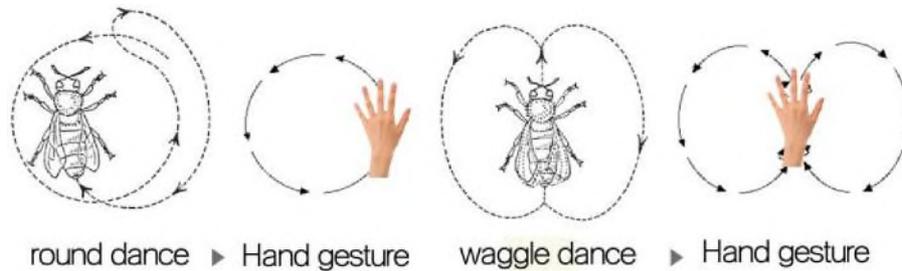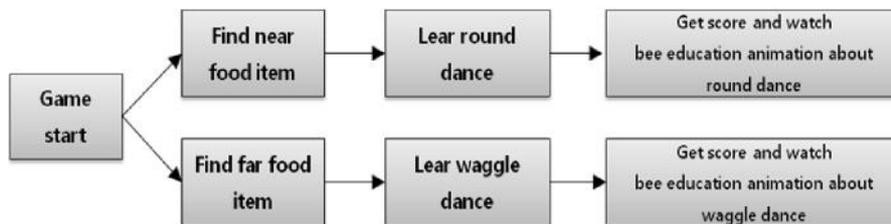
Fig. 4. Each dance and hand gesture in developed game



Fig. 5. Game process

Table 1 is game development specifications. We used Unity3D game engine to develop game. Point and circle gesture are recognized in our game. Target age is from 5age to 10age. Fig 3 shows game play flow plan and Fig 4 shows each dance and each hand gesture in developed game. Fig 5 shows game process.

## 4 Conclusion

We developed serious game for kids using "Leap Motion" based on honey bee dance. After investigation of honey bee dance, we applied it into serious game. The dances are performed by worker bees that have returned to the honeycomb. The movement of the hand is good for kid's brain development. It has already been proven through many materials. Kids can learn the language of bees through developed game and it is a natural form of play. Our system can propose the new development direction of serious game, also potential of Leap Motion as serious game device. In future work, we will develop game to learn more detail ecological habit of bee for kids.

# References

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